## REMARKS/ARGUMENTS

Claims 1-46 are currently pending in the application. Claims 5, 12 and 22-46 have been withdrawn by the Examiner. Claims 12 and 22-46 have been canceled. Claims 1-4, 6-11 and 13-21 are examined in the present Office Action. Applicants expressly reserve the right to file divisional applications or take such other appropriate measures deemed necessary to protect the inventions in the withdrawn and canceled claims. New claims 47-68 have been added in the present response. Claims 1, 8, 10-11, 13, 14 and 21 have been amended. Support for the amendments to the above-referenced claims can be found for example in the original claims and on pages 7-19 of the specification as originally filed. No new matter has been added by way of amendment. Applicants respectfully request reconsideration of the claims in view of the following remarks.

Detailed Action

*A. Election*

The Examiner acknowledges Applicants election, with traverse, of Group I, claims 1-4, 6-11 and 13-21 including SEQ ID NO: 7 encoding SEQ ID NO: 8. The Examiner states the requirement is deemed proper and is made final. The right to pursue examination of the non-elected pair of DNA and amino acid sequences is reserved.

*B. Specification*

The Examiner has objected to the specification for the improper identification of trademark names in the present application.

Applicants have now amended the specification on pages 36 and 38, thereby complying with MPEP §608.01(v). Applicants respectfully request that the objection be withdrawn.

Claim Objections

The Examiner objects to claims 1 and 4 for reading on non-elected inventions.

Applicants have now amended claims 1 and 4 to cancel the improper reading on non-elected inventions as suggested by the Examiner, thereby obviating this objection.

The Examiner further objects to claim 13 for being dependent on a non-elected claim.

Applicants have amended claim 13 to depend from claim 1 as suggested by the Examiner, thus obviating this objection. Applicants request reconsideration and withdrawal of the claim objections.

Claim Rejections Under 35 U.S.C. §112, First Paragraph

*Written Description*

Claims 1-4, 6-11 and 13-21 stand rejected under 35 U.S.C. §112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The Examiner states that "Applicants do not identify essential regions of an IPPK protein encoded by SEQ ID NO: 7, nor do Applicants describe any polynucleotide sequences that have at least 75% sequence identity with SEQ ID NO: 7 that encode a functional IPPK protein or encode a polypeptide comprising at least 25 contiguous amino acids of SEQ ID NO: 8". The Examiner further states that "[s]ince the genus of IPPK proteins has not been described by specific structural features, the specification fails to provide an adequate written description to support the breadth of the claims".

It is submitted that the claims require a substantial portion of the structure of SEQ ID NO: 7. The claims are drawn to an isolated nucleic acid comprising a polynucleotide having at least 75% sequence identity compared to the full-length sequence of SEQ ID NO: 7, a polynucleotide which encodes a polypeptide of SEQ ID NO: 8, and a method for modulating inositol polyphosphate kinase activity in a host cell or plant comprising

transforming said host cell or plant with said polynucleotide. Although not acceding to the Examiner's rejection, Applicants have now amended claim 1 to delete "75%" and include ---80%--, thereby further describing the claimed invention.

Applicants further assert that the claimed invention does adequately describe the method for modulating inositol polyphosphate kinase (IPPK) activity (claim 14) and a method of decreasing the level of phosphorous thereby fulfilling the written description requirement. It would be unreasonable for the Examiner to require Applicants to supply functional domain data when the claim language clearly delineates the scope of the invention.

The Examiner quotes the Court of Appeals for the Federal Circuit when stating that a "written description of an invention involving a chemical genus, like a description of a chemical species, 'requires a precise definition, such as by structure, formula [or] chemical name,' of the claimed subject matter sufficient to distinguish it from other materials." *University of California v. Eli Lilly and Co.*, 1997 U.S. App. LEXIS 18221, at *23 quoting *Fiers v. Revel*, 25 USPQ2d 1601, 1606 (Fed. Cir. 1993) (bracketed material in original).

Applicants submit that they have met the written description requirement as set forth by the Court of Appeals for the Federal Circuit.

A central issue in the case of *University of California v. Eli Lilly and Co.*, 43 USPQ2d 1398 (Fed. Cir. 1997) involved the validity of a claim directed to a microorganism containing human insulin-encoding cDNA (claim 5 in the University of California U.S. Patent No. 4,652,525). As stated on page 1405 of *University of California v. Eli Lilly*, "[T]he patent describes a method of obtaining this cDNA by means of a constructive example, Example 6. This example, however, provides only a general method for obtaining the human cDNA (it incorporates by reference the method used to obtain the rat cDNA) along with the amino acid sequences of human insulin A and B chains." Page 1405 also states "[B]ecause the '525 specification provides only a general method of producing human insulin cDNA and a description of the human

insulin A and B chain amino acid sequences that cDNA encodes, it does not provide a written description of human insulin cDNA."

Unlike the situation in *University of California v. Eli Lilly*, the instant specification provides specific methods and a complete written description for the polynucleotides and polypeptides of the claimed invention. Methods of making and using the sequences of the invention are fully taught (specification, pages 7-30). Specific SEQ ID's and methods of further modifying these SEQ ID's are also fully taught (specification, pages 7-30). In contrast to the '525 specification in *Lilly*, the instant specification sets forth specific parameters, e.g. number of substitutions, percent identity, and the like, all in reference to specific SEQ ID's, which describe and define the claimed invention. Also, Applicants teach on pages 39-46 of the specification, identification and isolation of the IPPK genes using PCR and use of vectors for plant transformation in the claimed invention.

The Examiner states that "Applicants only describe a single cDNA of SEQ ID NO: 7". The Examiner rejects the claims on the basis that "Applicants fail to describe a representative number of polynucleotide sequences encoding a IPPK protein or structural features common to members of the claimed genus of polynucleotides".

Applicants respectfully traverse this rejection. Applicants assert the specification does describe a representative number of cDNAs, defined by nucleotide sequence and clearly identify a maize IPPK protein for one of ordinary skill in the art. The written description requirement, as described in *Lilly* supports that the breadth of description in the instant specification is adequate to support the claims. As stated in *Lilly*, "a description of a genus of cDNAs may be achieved by means of a recitation of a representative number of cDNAs, defined by nucleotide sequence, falling within the scope of the genus..." *Id.* at 1406. *Lilly* further cites *In re Angstadt*, 537 F.2d 498, 190 USPQ 214 (CCPA 1976), for the proposition that "applicants are *not* required to disclose *every* species encompassed by their claims even in an unpredictable art". *Id.* at 1406.

Applicants submit that description of a representative number of embodiments has been accomplished in the instant specification. Applicants have taught twelve species of the polynucleotides and polypeptides in SEQ ID NOS: 1, 3, 5, 7, 9, 11, 13, 15, 17, 20, 22, 24 and SEQ ID NOS: 2, 4, 6, 8, 10, 12, 14, 16, 21, 23, 25, 29-37, respectively. Throughout the specification Applicants teach how to obtain the claimed polynucleotides, polypeptides and IPPK proteins, both through modification of nucleic acid sequences coding for the claimed proteins and through further modification of the proteins themselves. Without question, Applicants have taught those of ordinary skill in the art how to make and use the claimed nucleic acid, with the structural feature of 80% sequence identity, and method for modulating inositol polyphosphate kinase (IPPK).

Applicants have gone to great lengths to structurally define their claims as those useful in the practice of the present invention. Applicants, by virtue of structural limitations already present in the claims have adequately defined the invention to a scope that bears a reasonable correlation with the scope of written description.

For the reasons stated above, Applicants believe that the subject matter of the claims was described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Notwithstanding, Applicants have further limited the claims to 80% sequence identity in claim 1 in order to expedite prosecution of these claims.

Accordingly, Applicants request that the rejection of claims 1-4, 6-11 and 13-21 under 35 U.S.C. §112, first paragraph, be withdrawn.

*Enablement*

The Examiner has rejected claims 1-4, 6-11 and 13-21 under 35 U.S.C. §112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The Examiner states that "Applicants have only disclosed the cloning of SEQ ID NO: 7 encoding SEQ

ID NO: 8, but Applicants do not disclose the outcome of transforming said sequence into maize". The Examiner further states that "Applicants do not report if the introduced nucleic acid increased the phytic acid content or if inositol polyphosphate kinase activity or levels were modulated". Thus the Examiner states, "Applicants do not teach by way of examples the use of the claimed sequences to modulate IPPK activity or levels".

The Applicants respectfully traverse this rejection. It would be unreasonable to require Applicants to detail every permutation of the invention which would function as claimed. The Court stated in *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991): "...we do not imply that patent applicants in art areas currently denominated as 'unpredictable' must never be allowed generic claims encompassing more than the particular species disclosed in their specification. It is well settled that patent applicants are not required to disclose every species encompassed by their claims, even in an unpredictable art..."

The Applicants respectfully assert that they have in fact provided several points of specific guidance with respect to modification of disclosed sequences. Applicants do teach modulation of SEQ ID NO: 7. Suppression of IPPK will decrease the activity of IPPK of SEQ ID NO: 8, thereby decreasing the phytate level, increasing the level of non-phytate phosphorous of a plant and decreasing the level of phosphorous in non-ruminant animal waste.

Pages 18-19 of the present application describe various methods for suppression of gene expression, including sense suppression.

> A polynucleotide of the present invention can be expressed in either sense or anti-sense orientation as desired. In plant cells, it has been shown that antisense RNA inhibits gene expression by preventing the accumulation of mRNA which encodes the enzyme of interest, see, e.g., Sheehy et al., *Proc. Natl. Acad. Sci. USA* 85:8805-8809 (1988); and Hiatt et al., U.S. Patent No. 4,801,340.
>
> Another method of suppression is sense suppression. Introduction of nucleic acid configured in the sense orientation has been shown to be an effective means by which to block the transcription of target genes. For an example of the use of this method to modulate expression of endogenous genes

see, Napoli et al., *The Plant Cell* 2:279-289 (1990) and U.S. Patent No. 5,034,323.

Recent work has shown suppression with the use of double stranded RNA. Such work is described in Tabara et al., *Science* 282:5388:430-431 (1998), WO 99/53050 and WO 98/53083.

Catalytic RNA molecules or ribozymes can also be used to inhibit expression of plant genes. The inclusion of ribozyme sequences within antisense RNAs confers RNA-cleaving activity upon them, thereby increasing the activity of the constructs. The design and use of target RNA-specific ribozymes is described in Haseloff et al., *Nature* 334:585-591 (1988).

Further, the Examiner refers to the teachings of *In re Wands*. *In re Wands*, 858 F.2d 731, 8 USPQ 2d 1400 (Fed. Cir. 1988) lists eight considerations for determining whether or not undue experimentation would be necessary to practice an invention. These factors are: the quantity of experimentation necessary, the amount of direction or guidance presented, the presence or absence of working examples of the invention, the nature of the invention, the state of the prior art, the relative skill of those in the art, the predictability or unpredictability of the art, and the breadth of the claims.

The test of enablement is not whether experimentation is necessary, but rather if experimentation is necessary, whether it is undue. *In re Angstadt*, 190 USPQ 214, 219 (C.C.P.A. 1976). A considerable amount of experimentation is permissible if it is merely routine, or if the specification provides a reasonable amount of guidance in which the experimentation should proceed. In the present case, the experimentation required is routine and has been well described in the specification (pages 36-53). The specification also provides working examples of the invention. The skill in the art is high and the claims, including 80% sequence identity to the claimed sequences, are commensurate in scope with the disclosure in the specification.

Further the sole issue before the *Wands* court was whether the specification enabled the claims in the absence of a deposit. The present claims adequately enable the claimed invention as the structure has been provided to those skilled in the art by further exhibiting an 80% sequence identity with SEQ ID NO: 7. Therefore, Applicants

assert that the amended claims along with the requirement encoding an IPPK protein of SEQ ID NO: 8 provide adequate enablement for one skilled in the art.

Thus, determination of the protein structure from sequence data that meet the conditions of the claims is a matter of routine experimentation well within the scope allowed by law. See *In re Wands*, 858 F2d 731, 737 (Fed. Cir. 1988), where the court reversed the Board of Patent Appeals and Interferences for holding a biotechnology application not enabled under §112, first paragraph, allegedly because obtaining the claimed subject matter required screening a vast number of cells lacking the claimed function. The *Wands* Court also noted that practitioners in the art routinely engage in such testing. Clearly, even considerable testing is permitted so long as it is routine, as is the case here.

The Applicants acknowledge that while certain sequences may be inoperable, it is well within the realm of reasonable experimentation for a person of skill in the art to generate non-exemplified sequences by using the disclosed full-length of SEQ ID NO: 7 or by designing primers to regions of SEQ ID NO: 8, to produce expression vectors and then transform plants therewith and determine which are operable. It is well established that "[e]ven if some of the claimed combinations [are] inoperative, the claims are not necessarily invalid. 'It is not a function of the claims to specifically exclude...possible inoperative substances...' *In re Dinh-Nguyen*, 492 F.2d 856, 858-59, 181 USPQ 46, 48 (CCPA 1974) (emphasis omitted)."

Applicants respectfully assert that the social contract of patents requires full disclosure of the invention in return for a right to exclude others from making, using, or selling such invention. In this case the Applicants have fulfilled their obligation by disclosing the full-length SEQ ID NO: 7, a polynucleotide coding for a IPPK protein, a vector, host cell and plant transformed therewith and a method for modulating inositol polyphosphate kinase activity. If the Patent and Trademark Office policy were to allow Applicants patent protection only as to the exact sequence submitted, patentees would be unfairly disadvantaged in that a potential infringer could easily make and test sequence modifications to derive functional fragments and thereby readily circumvent

the patent. The combination of disclosure (i.e., a specific, full-length sequence as a starting point) and level of skill in the art (as indicated by references describing directed mutagenesis and deletion analysis) must be considered in determining whether the invention is enabled.

In addition, the Applicants note that the Examiner has cited Martino-Catt *et al.* (US Patent No. 6,197,661; column 2, lines 59-61) and Bohnert *et al.* (The Plant Cell 7: 1099-111, 1995) as evidence of the "biosynthetic route leading to phytate is complex and not completely understood."

The present application provides a complete description of how to make and use the present claimed invention. It is not required to define all aspects of a pathway to obtain the desired result of reduced phytate.

In light of the above amendments and remarks, Applicants respectfully request reconsideration and withdrawal of the rejections for enablement to claims 1-4, 6-11 and 13-21 under 35 U.S.C. §112, first paragraph.

Claim Rejections Under 35 U.S.C. §101

The Examiner has rejected claims 10-11 under 35 U.S.C. §101 because the claimed invention is directed to non-statutory subject matter. The Examiner states "given that there is no indication that there would be any other distinguishable characteristics of the claimed seeds, it is unclear whether the claimed seeds would be distinguishable from seeds that would occur in nature".

Applicants have amended claims 10-11 to recite that the seeds comprise the construct that was introduced into the parent plants, as suggested by the Examiner, thereby overcoming this rejection.

Applicants note that claims 1-4, 6-11 and 13-21 are deemed free of the prior art. The Examiner further states the prior art fails to teach or reasonably suggest an isolated polynucleotide of SEQ ID NO: 7 encoding SEQ ID NO: 8, and vector, host cell and plant transformed therewith and a method of modulating inositol polyphosphate

kinase and method of decreasing the level of phosphorous in non-ruminant animal waste comprising said polynucleotide.

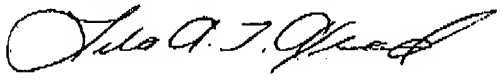
## CONCLUSION

In conclusion, Applicants submit in light of the above amendments and remarks, the current claims are in a condition for allowance, and reconsideration is respectfully requested. If it is felt that it would aid in prosecution, the Examiner is invited to contact the undersigned at the number indicated to discuss any outstanding issues.

This is a request under the provision of 37 C.F.R. § 1.136(a) to extend the period for filing a response in the above-identified application for one month from September 3, 2004 to October 3, 2004. Applicants are a large entity; therefore, please charge Deposit Account No. 16-1852 in the amount of $110.00 for one month to cover the cost of the extension. Any deficiency or overpayment should be charged or credited to Deposit Account 16-1852.

Reconsideration and allowance is respectfully requested.

Respectfully submitted,



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